

Field Artillery Cannon Systems Update

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The Training and Doctrine Command (TRADOC) System Manager-Cannon (TSM-Cannon), Fort Sill, Oklahoma, maintains current cannon programs and develops relevant and ready systems to support the future military. TSM-Cannon's mission is to be the Army's centralized manager for all combat developments user activities related to the non-line-of-sight cannon (NLOS-C), Excalibur 155-mm precision-guided munitions and M777 lightweight 155-mm howitzer system with towed artillery digitization (TAD) and modernization activities associated with the current fleet of cannon artillery systems. We, at TSM-Cannon, support a current and future Army that is capable of

success in any contingency, from humanitarian assistance to full tactical operations in joint and combined environments.

Many Field Artillerymen are unaware of recent fieldings in

cannon artillery programs, unsure of the direction cannon artillery is headed in support of modularity and the future combat system (FCS), and uncertain of what capabilities soon will be available to support our maneuver brethren. TSM-Cannon recently has answered many questions that indicate the field's lack of knowledge about our programs. The questions most often are based on rumors, someone's opinion or myths. This article dispels some of those misconceptions and briefly defines the azimuth for cannon programs and ammunition.

Current Cannon Systems. The following is an update on existing systems.

- **M119.** By the end of 2005, all Active Component (AC) and Army National Guard (ARNG) M119A1 105-mm towed howitzers were modified into M119A2s. The upgrade enhances the guns' handles and fittings to make them easier to operate and maintain—in short, make them more user friendly.

We also are manufacturing 385 new M119A2s. Deliveries will begin in January 2008.

The new guns will come off the assembly line as M119A2s and will include additional modifications requested by the field to improve the guns' maintainability and durability.

Artist's Rendition of
the Non-Line-of-Sight
Cannon (NLOS-C)



These modifications include improving the firing platform by enlarging the drain holes, increasing the swivel clearance to prevent binding and assembling the howitzer with screws instead of rivets to facilitate repair work.

The new guns will complete the M119A2 modular force fielding to both AC and ARNG units.

We also are exploring the viability of adding a light digitization package similar to the M777A1's digital fire control system to the M119A2 to give it self-locating and laying capabilities. The package will allow the gun to fire global positioning system-(GPS)-guided munitions.

- **M109.** A team from the Unit Training and Equipment Site (UTES) in Columbia, South Carolina, began retrofitting the South Carolina ARNG 1-78 FA Paladins and FA ammunition support vehicles (FAASVs) for the modular artillery charge system (MACS) and Excalibur on 13 September 2005.

At Fort Hood, Texas, a retrofit team installed the Paladin digital fire control system (PDFCS) in 4th Infantry Division Paladins and is in the process of installing the system in 1st Cavalry Division Paladins.

PDFCS is replacing the Paladin's automated fire control system (AFCS). It will allow units to input data for guided projectiles, such as Excalibur. It also has Force XXI brigade and below (FBCB²) technology embedded, which gives the howitzer section significantly enhanced situational awareness.

The next division to be retrofitted with the PDFCS will be the 3rd Infantry Division when it returns from Iraq in 2006. Future funding will determine the fielding schedule for the rest of the force.

Currently, all AC and ARNG Paladins are being retrofitted with a storage capacity for 10 Excalibur (not in containers).

- **M198.** The M198's firing mechanism has been modified to allow the system to fire Zone 5 MACS. The retrofit of all howitzers was completed in December 2005.

- **M102.** Currently there are 216 M102 105-mm towed howitzers still in service in the ARNG. M119A2s will begin replacing these systems in 2008, as currently scheduled.

Future Cannon Systems. The following are cannons being fielded or about to be fielded.



The lightweight 155-mm (LW155) joint towed howitzer eventually will replace all Marine Corps and Army M198 howitzers.

- **Lightweight 155-mm (LW155).** This is a joint towed howitzer that eventually will replace all Marine Corps and Army M198 howitzers.

The Marines are fielding the basic M777, which uses conventional optical fire control. A total of 94 M777s will be fielded to the 11th Marines at Camp Pendleton and 29 Palms, California, and the Marine Detachments at the Field Artillery School at Fort Sill, Oklahoma, and the Ordnance School at Aberdeen Proving Ground, Maryland. Fielding will be completed this year.

When the digital fire control system (DFCS) is integrated into the M777, the howitzer will be redesignated the M777A1. It will provide location, directional reference and digital communications for the fire direction center (FDC). It will provide close and deep fire support, counterfire and interdiction fires and be rapidly deployable to any region and operable in most climates.

The first M777A1s will be fielded to 2-11 FA, 25th Infantry Division, Schofield Barracks, Hawaii, in August 2006.

In early 2007, software and hardware upgrades will make the M777A1 Excalibur-capable, redesignating it as the M777A2.

At the same time, the Marines will begin fielding the M777A1 to the 10th Marines at Camp Lejeune, North Carolina, and retrofitting their M777s to M777A1s. When the Marines Corps acquires Excalibur projectiles, its M777A1s will be brought up to a common M777A2 configuration.

The Marines will field a total of 356 LW155 howitzers (including the 94 original M777s), completing fielding in 2009. The Army currently is looking to buy at least 252 M777A2s, completing fielding in 2010.

- **NLOS-C.** This system is a variant in the FCS family of systems. The NLOS-C will have a chassis in common with the FCS family of vehicles and have similar interoperability, mobility and survivability characteristics. This program leverages

Training and Doctrine Command (TRADOC) Systems Manager for Cannons (TSM-Cannon)—What It Is. TSM-Cannon is a client-oriented Commanding General, TRADOC, program responsible for managing and developing all current and future cannon and munitions systems. It integrates the warfighting requirements for all assigned systems into the domains of doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF). TSM-Cannon represents the cannon artillery warfighter.

TSM-Cannon is authorized by the Commanding General, TRADOC, to assume all responsibility for total systems management of assigned systems. The TSM-Cannon acts on behalf of the Commandant of the Field Artillery School on matters such as chartered cannon artillery and munitions systems.

the work of the Crusader program and will have similar advanced capabilities on its platform.

Beginning in 2014, the NLOS-C system will provide networked, extended-range fires and precision attack of point and area targets to support the FCS brigade combat team (FBCT) or legacy modular BCTs. The NLOS-C will provide sustained fires for close support and destructive fires for tactical standoff engagements and have a suite of munitions, including special purpose munitions. Its primary purpose will be to provide responsive fires in support of BCTs and their subordinate units in concert with line-of-sight (LOS), beyond-line-of-sight (BLOS) and other NLOS systems, including those external and joint.

The NLOS-C will have the flexibility to change effects round-by-round and mission-by-mission. Combined with the system's ability to respond to calls-for-fire rapidly and its rapid rate of fire, the NLOS-C will be able to provide a variety of effects on demand.

The FCS program recently underwent a dramatic revision of its fielding schedule. At its original Milestone B approval, the first BCT to be fielded would have achieved its initial operational capability (IOC) in 2010; the prototype NLOS-Cs

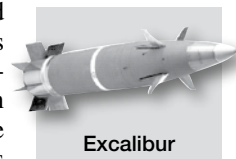
would have been delivered in 2008. The new BCT fielding schedule is in the draft stage, but overview briefings now show the first BCT IOC in 2014 with the BCT fully operational in 2017.

Munitions, Charges and Fuzes. The following are future munitions and related support systems.

- **Excalibur.** Excalibur is an extended-range projectile that attacks high-payoff targets (HPTs) and the most dangerous targets in all weather and all terrain types in the close fight. It minimizes collateral damage through concentrated lethality and increased precision. It is GPS-guided, making it a fire-and-forget munition—the first ever US cannon fire and forget munition.

Excalibur can attack a full range of targets, including reinforced bunkers and buildings, delivering a large amount of firepower into a small space at ranges exceeding the current 155-mm munitions. Excalibur reduces the dispersion or circular error probable (CEP) from the current maximum of 370 meters to 10 meters at all ranges.

In March 2005, the Army Resource and Requirements Board approved



Excalibur

early fielding with rounds scheduled for delivery in the Central Command (CENTCOM) theater in March. Excalibur requires a revision to the advanced FA tactical data systems (AFATDS) software and a portable fuze setter.

Excalibur has proven to be very accurate in testing. Two rounds (minus the warheads) were fired at Yuma Proving Ground, Arizona, in November and December 2004. They landed 3.4 and 6.9 meters from the targets. In September 2005, Yuma conducted an integrated warhead shoot. The gun-to-target range was 15.2 kilometers, and the round landed seven meters from the target.

The Fire Support Test Directorate, Fort Sill, demonstrated Excalibur 13-16 June 2005 to validate the AFATDS software and tactics, techniques and procedures (TTPs) for Excalibur. The directorate found some minor deficiencies with the AFATDS software and suggested revisions to the TTPs.

The 1st Cav, 4th Infantry and 1st Armored Divisions will receive Excalibur familiarization training before deploying to the CENTCOM theater and new equipment training (NET) in theater to introduce the projectile, updated AFATDS software and TTPs to the operators. The Army's procurement objective currently is 30,000 projectiles.

- **MACS.** This uses a "build-a-charge" concept in which increments are identical to all others in the same lot designation, eliminating the need to dispose of unused increments. Unused increments are held for future use.



Modular Artillery Charge System (MACS)

MACS consists of two propelling charges, the M231, M232/M232A1 and associated packaging. It is compatible with all current and planned 155-mm FA weapons systems.

The M231 MACS is for "low zone" (shorter ranges) and M232 MACS is for "high zone" (longer ranges); both have been optimized for 52-caliber 155-mm tubes and "materiel released." This means the propellants have been tested and evaluated and have met all operational requirements. Both propellants are now in the inventory (war reserve) and will replace the existing bag propellants as the low stocks are depleted.

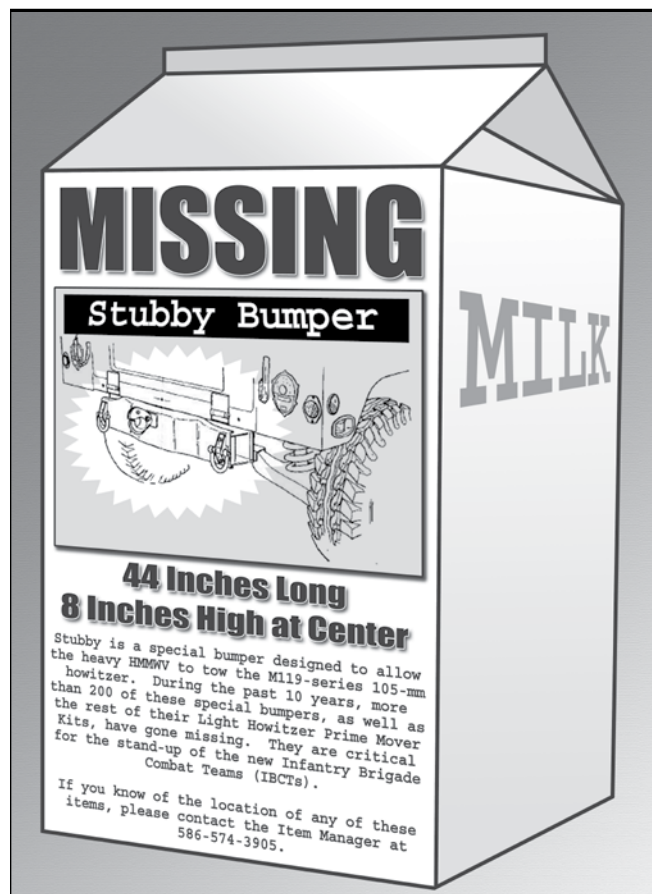
The M232A1, optimized for 39-caliber 155-mm howitzer tubes, has been type-classified and will be materiel released along with AFATDS Block II software in December 2006, as currently scheduled. Recent testing of the M232A1 has shown a significant reduction in tube wear (approximately doubles tube life) and a decrease in tube residue.

- **Multi-Option Fuze Artillery (MOFA).** The M782 MOFA fuze is an inductively set fuze used with bursting projectiles. It has four functions: point detonating, delay, time and proximity.



Multi-Option Fuze Artillery (MOFA)

Its multiple options simplify the burden of tracking multiple fuzes in the logistics train.



MOFA will replace eight fuzes currently in the inventory as the stockpiles of those fuzes are depleted.

The fuze will be set with the portable inductive fuze setter (PIAFS). The fuze will be compatible with automated ammunition handling equipment on the NLOS-C.

Currently 600,000 fuzes are being produced, all slated for war reserve.

• **Precision Guidance Kit (PGK).** The PGK is a fuze-sized "module" that will have GPS to provide the location of the round and time during its flight while an inertial navigation system (INS) will determine the trajectory and continuously correct the round for increased accuracy. It will have all the capabilities of the MOFA fuze plus the precision guidance of GPS/INS.



Precision Guidance Kit (PGK).

PGK will reduce delivery errors significantly. PGK is being designed for less than a 30-meter CEP at all ranges. In short, PGK will transform a "dumb projectile" into a "smart projectile" and significantly reduce the number of rounds required. Currently, the PGK is projected for fielding in 2009.

PGK will be complementary to Excalibur, not a competitor. It will provide more efficient suppression vice the point precision of Excalibur.

PGK testing demonstrated consistent performance in predicted range and deflection. The GPS, control system and brake deployments functioned as designed. Additional testing achieved a precision of a 20-meter CEP versus a 55-meter CEP for the control rounds.

Evaluation of test data and additional aerodynamic work on the PGK is ongoing.

• **Advanced Cannon Artillery Ammunition Program (ACAAP).** ACAAP is a product-improvement program for the 105- and 155-mm cannon ammunition. The entire ACAAP suite of munitions will have ballistic similitude, which means it will have one set of firing tables for all projectile types.

ACAAP also will provide the ability to change all rounds from boat-tail configuration to base bleed in the field. This will allow a commander to increase the range of each projectile at his discretion.

Funding has been approved to begin production of ACAAP 105-mm rounds in 2008.

The TSM-Cannon site on the Fires Knowledge Network (FKN), part of Army Knowledge Online (AKO), will keep the community updated on the future of cannon artillery. But the field should not hesitate to contact the TSM-Cannon and give us feedback—give us your "wish list." We will discuss your ideas and pass them on to the relevant project managers. Contact us at commercial (580) 442-6902 or DSB 639-6902 or via email at tsm.cannon@us.army.mil.

To determine the best cannon capabilities for the field, we also analyze other governments' weapons and ammunition systems for developments. In addition, we meet with industry to explore new technologies and discuss requirements and with project managers to discuss the way ahead. In every case, they listen. We want to convey the right message, the right requirements, and with your help, that's exactly what we'll do.

Colonel John A. Tanzi has been the Training and Doctrine Command (TRADOC) System Manager for Cannons (TSM-Cannon) in the Futures Development and Integration Center, Fort Sill, Oklahoma, for eight months. In his previous assignment, he was the Director of Support Operations in the Center for Strategic Leadership at Carlisle Barracks, Pennsylvania. He commanded 3d Battalion, 82d Field Artillery (3-82 FA), part of the 1st Cavalry Division at Fort Hood, Texas. He deployed with his battalion to the Afghanistan with Task Force Blackhawk in support of Operation Enduring Freedom. While in the 2nd Infantry Division in the Republic of Korea, he also commanded Service Battery, 1-4 FA and, then, A Battery, 1-4 FA. Among other assignments, he was the Deputy Fire Support Coordinator for III Corps and Executive Officer for 2-82 FA and Division Artillery Assistant S3 in the 1st Cav, all at Fort Hood; and Reinforcing Team Trainer and Assistant Deputy Fire Support Observer/Controller at the National Training Center, Fort Irwin, California.

Lieutenant Colonel Robert D. Harper has been the TSM-Cannon Executive Officer for one year and eight months. In his previous assignment, he was the Test Officer for the Bradley Fire Support Team Vehicle (BFIST) and Improved Position and Azimuth Determining System (IPADS) Programs as part of the Fire Support Test Directorate at Fort Sill. He also served three years in TSM-Cannon as the Crusader Action Officer and managed the Modular Artillery Charge System (MACS), Multi-Option Fuze Artillery (MOFA) and Portable Inductive Fuze Setter (PIAFS) Programs in their infancy. He commanded Headquarters and Headquarters Service Battery in 2-8 FA at Fort Lewis, Washington, part of the 25th Infantry Division (Light).

Google Search Coming to *Field Artillery Archives*

By the end of February, you will be able to search our magazine archives online with Google Mini software—search for key words in magazines by year or blocks of years.

We are redesigning our archives and website to make them easily searchable and more user friendly. Users worldwide will be able

to search for key words and download entire magazines or specific articles using less bandwidth.

Currently, we have the most recent edition of the magazine back through 1959 in our archives online: sill-www.army.mil/famag.

Help! We Need 1913 *Field Artillery Journals*

We are preparing to let a contract to scan magazines from 1911, the first year of *Field Artillery Journals*, through 1958 and post them on our website. When the contract is complete, you will be

able to access and Google search all magazines from 1911 through the current edition.

However, the Rare Books Section of the Morris Swett Library at the FA School is missing both copies of its bound 1913 magazines. We need copies to scan.

If anyone has a 1913 *Field Artillery Journal* and would be willing to ship it to us for scanning and return, call us at (580) 442-5121/6806 or DSN 639-5121/6806 or email us at famag@sill.army.mil. Please call us before you send the magazine, so we don't end up with duplicate editions.

